



Advanced Exploration Systems (AES) Small Spacecraft Missions

2021 NASA Small Spacecraft Forum

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March 25, 2021



Internal Solicitation Process - Engage NASA Centers through assigned AES POCs

- Exploration Capabilities Research and Development projects assigned and competed
 - Project Polaris is a new initiative to help our people meet the difficult challenges of sending humans to the Moon and Mars.
 - Project Polaris will create opportunities for our people to strengthen their skills, to gain hands-on experience, and to learn.
 - Project Polaris is focused on filling high-priority capability gaps and on infusing new technologies into human exploration flight programs.
 - Project Polaris builds and tests small flight experiments and conducts other risk reduction activities to rapidly mature critical technologies.
 - Project Polaris consists of small teams of mostly early career employees.
 - Project Polaris encourages leap ahead innovation and collaboration to accelerate technology development.

External Solicitation Process

- Next Space Technologies for Exploration Partnerships - NextSTEP

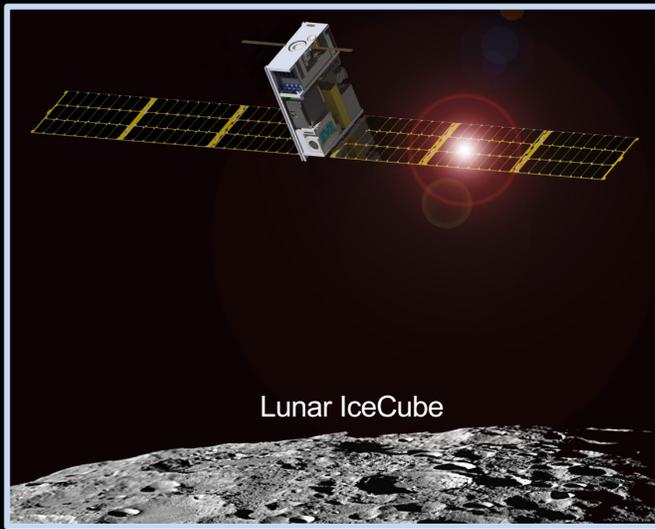
Priorities - HEOMD-405 Guidance

- Human Exploration and Operations Mission Directorate (HEOMD) Integrated Exploration Capabilities Gap List (HEOMD-405) represents the official set of approved capability gaps and gap-element mappings.
- The gap prioritization listed in HEOMD-405 should be used by HEOMD Programs when planning exploration-forward investments.

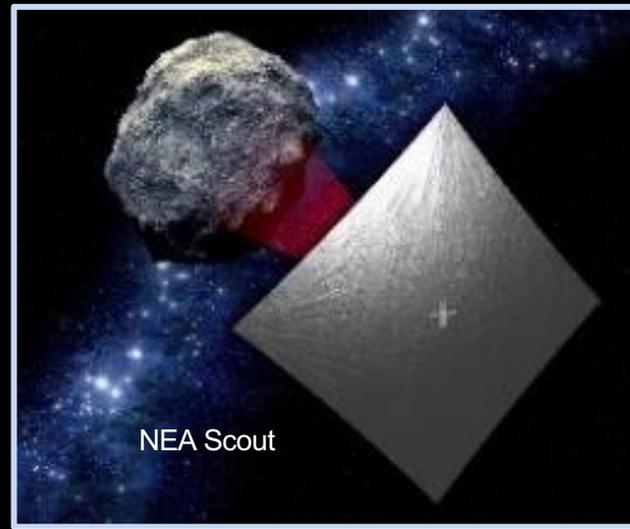
AES SmallSats Supporting Artemis



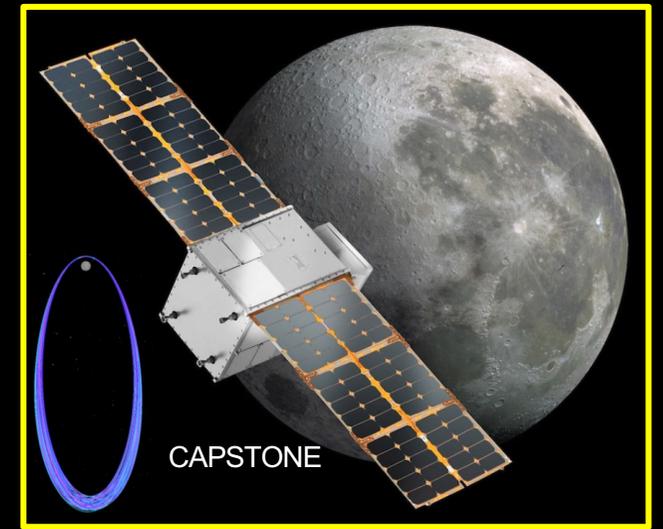
LunIR



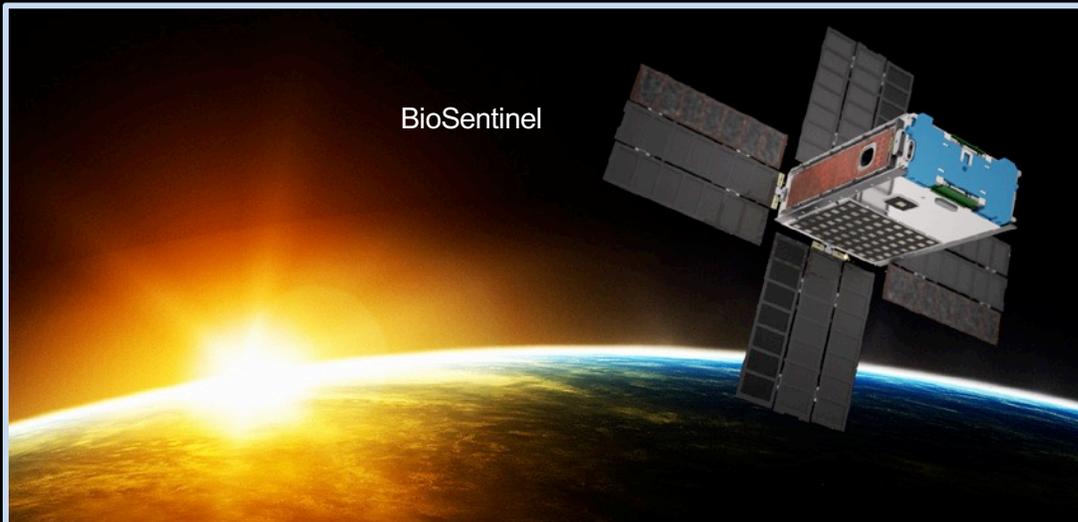
Lunar IceCube



NEA Scout



CAPSTONE



BioSentinel

Enabling interplanetary research with small spacecraft platforms

MarCO Demonstrations:

- Downlink Using X-Band Feed and DSN Equipment
- Downlink Using X-Band Feed and MarCO Receiver System
- OMSPA Using X-Band Feed and Custom SDR-based Multiple Receiver System

First Opportunistic Multiple Spacecraft Per Antenna (OMSPA) Demonstration with a CubeSat

Develops an operational capability to support Artemis-1 SmallSat missions

Expands DSN capabilities by utilizing non-NASA assets to provide communication and navigation services to small spacecraft missions to the Moon and inner solar system.

LRO Demonstrations:

- Routinely Tracking LRO at S-Band
- Intermediate Frequency (IF) Systems and DSN Downlink Equipment (DCO, DTT) Verified
- LRO Telemetry Blocks Sent Directly from DSS-17 to SFL DSSCO over the NASA Mission Backbone, verifying DSS-17 Signal Path

First 5 Demodulated Frames from MarCO OMSPA Demonstration on May 6, 2018 from DSS-17
 D. Abraham, Z. Towfic, S. Finley (JPL)
 C. Cornejo, M. Stratton, R. Krol (Morehead State)

Mission Ops Center at MSU

AES SmallSat Missions selected to contribute to key Human Exploration Strategic Knowledge Gaps and to Advance Key Technologies

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Thank you